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UNITED STATES DEPARTMENT OF AGRICULTURE

Maintaining Identity and Pure Seed of Southern Oat Varieties[1]

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INTRODUCTION

Maintaining varietal identity and purity in oats has been a perplexing problem for many years. The development of modern breeding programs and the consequent distribution of improved strains of a relatively small number of more or less distinct varieties in recent years has further complicated the problem.

In the classification of oats the first separation is made on the basis of species. Common or northern oats are grouped as belonging to *Avena sativa* L., and red or southern oats are grouped as belonging to *A. byzantina* C. Koch, thus constituting the two major groups of cultivated varieties. The second separation is made on form of panicle, that is, whether equilateral (spreading) or unilateral (one-sided). However, all the oat varieties grown on farms in the South have equilateral panicles. A third grouping is made on the basis of whether varieties ripen early, in midseason, or late; and a fourth grouping is made on the basis of grain color, that is, whether black, red, gray, yellow, or white. After a separation is made on the basis of these four major characters there is difficulty in further attempts to devise a satisfactory scheme of classification.

In the area corresponding fairly well with the Cotton Belt, varieties with red kernels (grains) are grown almost exclusively. Here the few major varieties, as a rule, can be fairly easily identified, but much confusion immediately arises in attempting to differentiate between strains of these varieties. Along the northern border of the winter-oat belt proper, that is, in parts of Virginia, North Carolina, Tennessee, and Arkansas, the hardier winter common varieties with gray or yellow kernels are grown, which usually are more easily identified.

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[1] Presented at the fortieth annual convention of the Association of Southern Agricultural Workers, New Orleans, La., February 2, 1939.

ENVIRONMENT FAVORS VOLUNTEERING AND CONTAMINATION

The mild winters of the South greatly favor the growth of volunteer oats and other volunteer grain, encourage the growth of weeds and the maturing of their seeds, and thus bring about the rapid contamination of oat varieties under farm culture. Samples of badly contaminated Red Rustproof and Fulghum oats grown for a few years on farms are shown in figure 1. Other factors favoring mechanical mixing and contamination of varieties are: (1) Home-grown seed of adapted varieties of good quality is not produced in the South in sufficient quantity to supply the demand; and (2) seed of poor quality and sometimes of unadapted variety is shipped in from other sections, more often by grain dealers than by seedsmen. As a result of this system of purchasing oats in commercial grain markets, many inferior and nondescript seed oats are sown each year in various sections of the South.

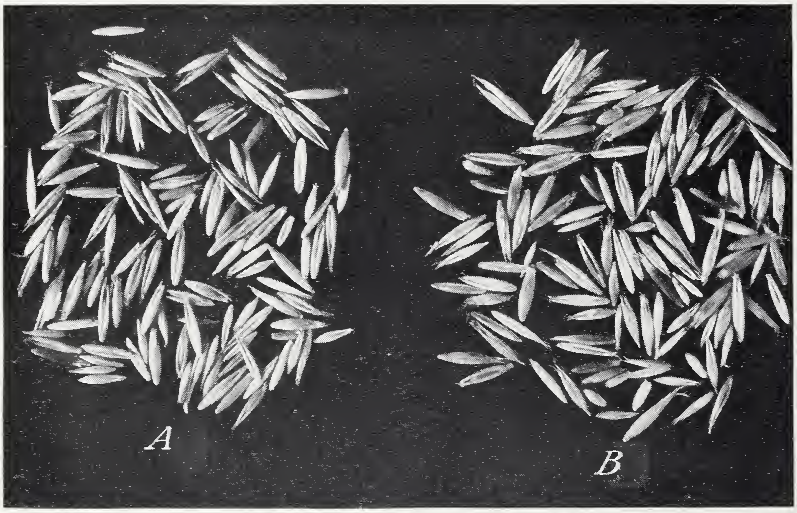

FIGURE 1.—Badly mixed stocks of (*A*) Fulghum and (*B*) Red Rustproof oats. Typical of many samples received for varietal identification.

Lack of harvesting and threshing machinery for handling the crop and the practice of cutting much of the crop for hay or harvesting it as bundle oats are other factors that serve to depress interest in the purity and quality of the oats produced. Very often where the crop is to be grown for these purposes the farmer is prone to use for seed almost any kind of oats that is readily available.

NEED FOR GREATER APPRECIATION OF SEED OF ADAPTED VARIETIES OF KNOWN BREEDING

It is well known that two strains of oats may be identical in all observable morphological characters and yet may differ in relative productiveness or performance. Therefore, it is very important that the first consideration be given to adapted varieties and the second consideration to strains of these varieties of known breeding. It is still too true in many sections (and this applies not only to the South) that too many farmers believe that "oats are just oats," and there is little appreciation of what is meant by varietal adaptation or pure seed stocks. Only strains of those varieties that by experimentation have proved to be the most suitable for a given environment should be recommended for sowing.

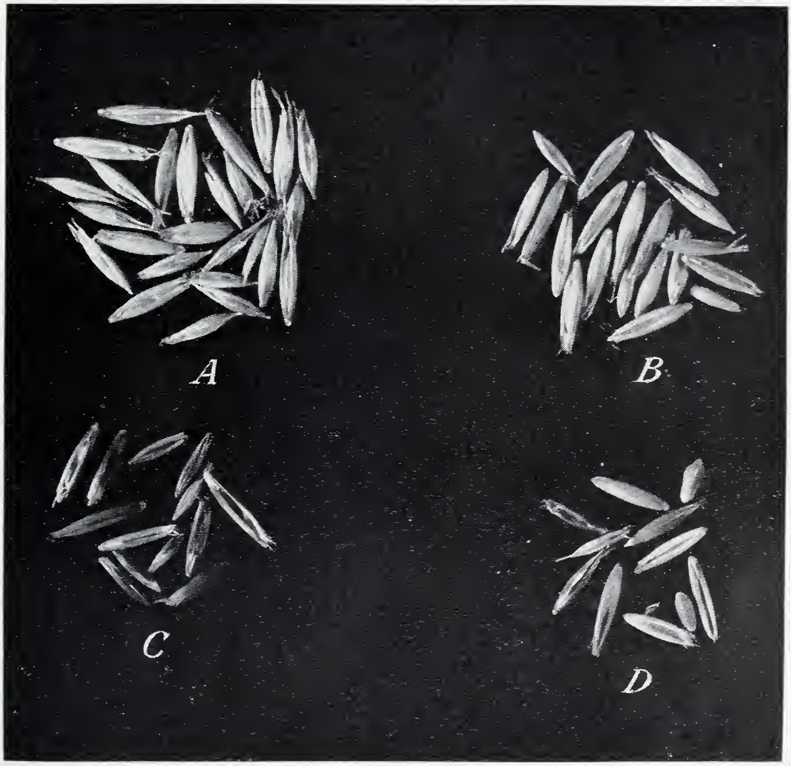

Figure 2.—Varieties separated from typical sample of mixed red oats: *A*, Red Rustproof; *B*, Fulghum; *C*, black oats; and *D*, other varieties and other grains.

During the last three decades there has been much confusion regarding the oat varieties grown in the South and this confusion still persists, as evidenced by the many samples received from seed dealers, State seed laboratories, etc., for varietal identification. These for the most part represent stocks of mixed oats in which the dominant variety is either Red Rustproof or Fulghum (fig. 2). Some of these samples represent Fulghum with a mixture of Red Rustproof, and others represent Red Rustproof with a mixture of Fulghum mixed in each case with other more or less nondescript varieties. An occasional lot of seed is labeled "Fulghum" when it should be labeled "Red Rustproof," and vice versa. Furthermore, in many samples the presence of other grains, noxious weed seeds, trash, and small, light secondary grains renders these oats unsuitable for seed purposes. Suggestions that may help in remedying this situation are offered in the pages that follow. A knowledge of the more important characters, particularly grain characters, by which the oat varieties of the South may be identified will be useful in this connection.

Since the advent of Fulghum a few decades ago as a commercial variety it has been confused with Red Rustproof, of which latter there are many named strains, such as Appler, Bancroft, Cook, Ferguson No. 71, Ferguson No. 922, Nortex, and others. Since 1938 Columbia, an early, productive spring variety, developed by the State Agricultural Experiment Station at Columbia, Mo., as a selection from another variety, has been confused on the winter oat seed markets with Winter Turf. The latter confusion is particularly unfortunate, because where Columbia is sown in the fall for the Winter Turf variety the crop is almost sure to be lost by winter-killing. Also, recently there has been some confusion of Fulgrain (Coker 33–19) with Fulghum. Descriptions and comparisons of the characters most useful for identifying these varieties, mainly from grain samples, follow.

VARIETAL CONFUSION

FULGHUM WITH RED RUSTPROOF

The characters of Fulghum oats have been described and compared with those of Red Rustproof in various publications of State agricultural experiment stations and the United States Department of Agriculture. Regardless of this fact, some agronomists, pathologists, and seedsmen, as well as farmers, are still confusing these varieties. As a rule, they can be distinguished easily one from the other in the field. From fall seeding the plants of Fulghum in the seedling stage are more erect or less spreading than those of Red Rustproof. The mature plants of Fulghum grow taller and have more erect panicles than Red Rustproof, and Fulghum ripens from a week to 10 days earlier. The top spikelets of the Fulghum panicle usually produce three florets or grains, whereas those of Red Rustproof usually produce only two grains. However, differentiating between the two varieties from grain samples is the chief problem. Panicles, spikelets, and florets (grains) of these varieties are shown in figure 3; enlarged spikelets and florets are shown in figures 4 and 5.

When matured under favorable conditions, the grains or kernels of Fulghum are yellowish red, sometimes described as a rich buff, whereas those of Red Rustproof are brownish red, that is, a darker red. Where the oats have been subjected to unfavorable weather conditions at harvest there may be so much discoloration that these differences cannot be used for identification. The grains of Red Rustproof are larger than those of Fulghum; that is, they are not much longer but are broader and more plump. This noticeably broader ventral portion of the Red Rustproof oat is a fairly reliable character for identification. In threshed oats the awns usually are removed, but the awn scars remain and may be readily observed and used as a mark of identification. In Red Rustproof awn scars will be found on all primary kernels and on most secondary kernels. In Fulghum, however, the awn scar will be found only occasionally on the primary kernel. In Red Rustproof there is a distinct basal cavity or scar left, sometimes called a suckermouth, where the first floret of the spikelet separates from its supporting pedicel. In most primary grains of Fulghum this scar is much less pronounced, sometimes obscure, or even absent (figs. 4, 5, 6).

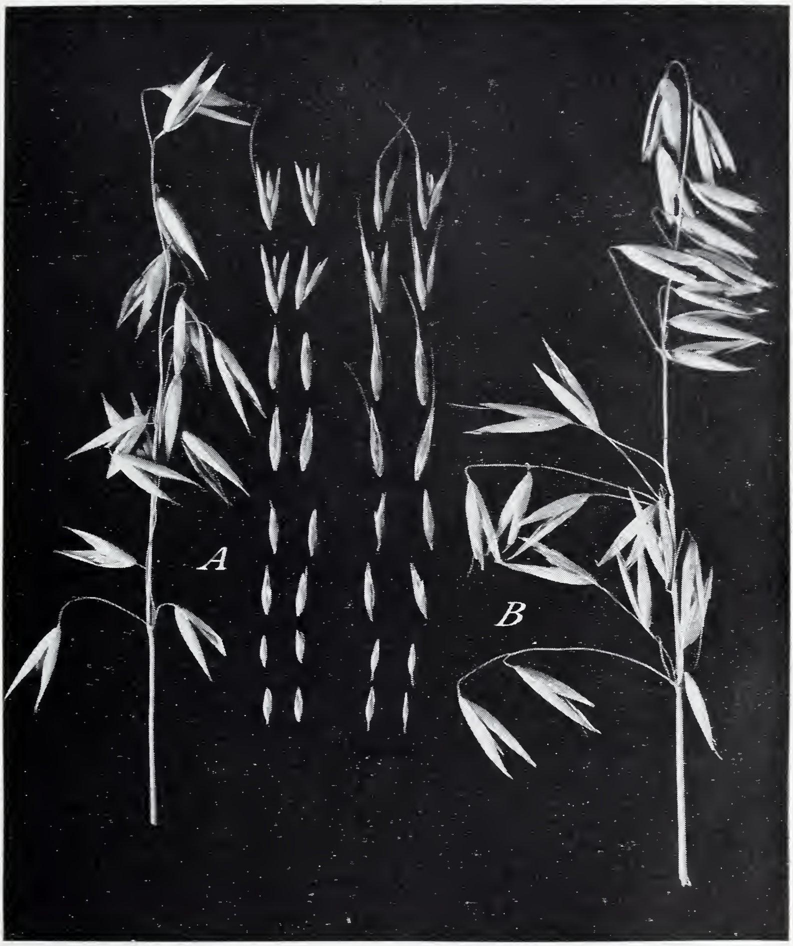

FIGURE 3.—Panicles, spikelets, and florets (grains) of (*A*) Fulghum and (*B*) Red Rustproof oats. (Natural specimens, not modified by threshing, etc.)

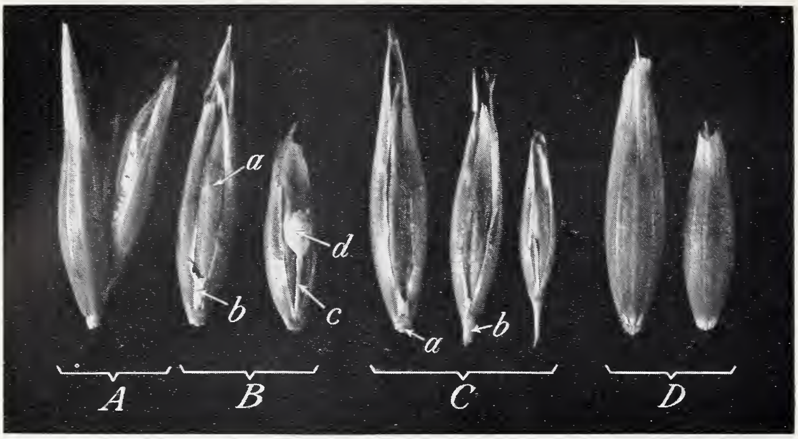

FIGURE 4.—Spikelets and florets (kernels or grains) of Fulghum oats: *A*, Spikelet with two florets. *B*, Ventral side of grains showing *sativa* type of floret separation: *a*, Palea; *b*, secondary floret rachilla segment; *c*, third floret rachilla segment; *d*, rudimentary third floret. *C*, Ventral side of grains from three-flowered spikelet showing *sterilis* type of floret separation: *a*, Small to obscure basal scar; *b*, secondary floret rachilla segment. *D*, Dorsal side of first and secondary grains.

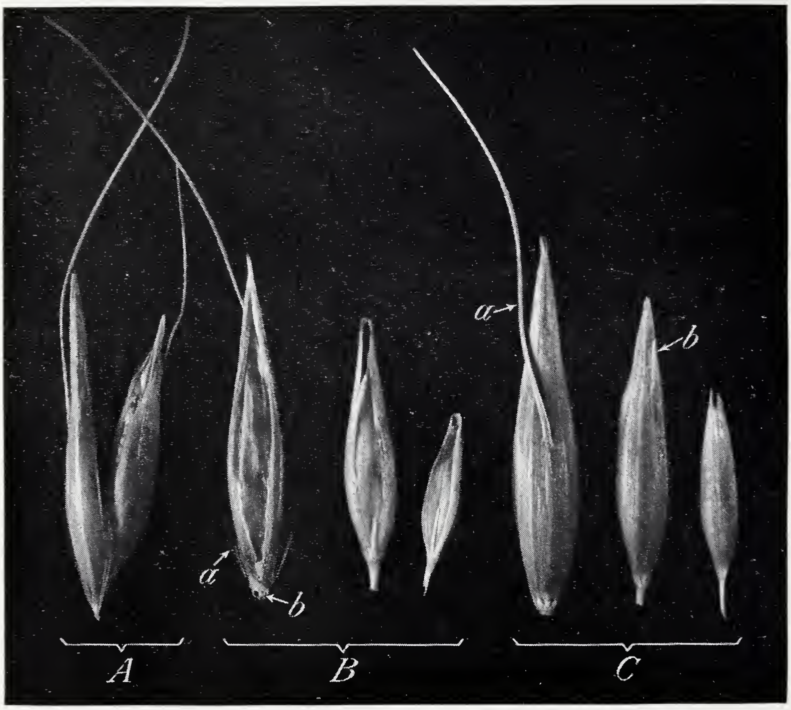

FIGURE 5.—Spikelets and florets (kernels or grains) of Red Rustproof oats: *A*, Spikelet with two florets, both awned. *B*, Ventral side of grains from a three-flowered spikelet: *a*, Basal hairs; *b*, large basal scar or suckermouth. *C*, Dorsal side of grains from three-flowered spikelet: *a*, Awn (beard) of straight or nontwisted type; *b*, awn partly broken off.

The mode of separation of the second floret (secondary kernel) from the first is only fairly reliable for differentiating these two varieties. In Red Rustproof the second grain always separates from the first by fracture of the rachilla segment (called rachilla by most writers) near the base of the first floret. This rachilla segment always adheres to the secondary grain or floret, as shown in figures 3, 5, and 6. In Fulghum about 50 percent of the second florets separate as in Red Rustproof, whereas the remainder separate as in common oats, that is, there is a more or less distinct disjointing (disarticulation) of the rachilla segment at the base of the second floret. In this latter mode of separation the rachilla segment remains on the first grain, as shown in figure 4. Also, Fulghum usually has fewer basal hairs than Red Rustproof; but since many of these hairs are removed in threshing, this character usually cannot be used with certainty in the identification of these varieties from grain samples. In general, however, confusion between these varieties does not seem justified, for with a little study and practice almost anyone can soon learn to identify them even from grain samples.

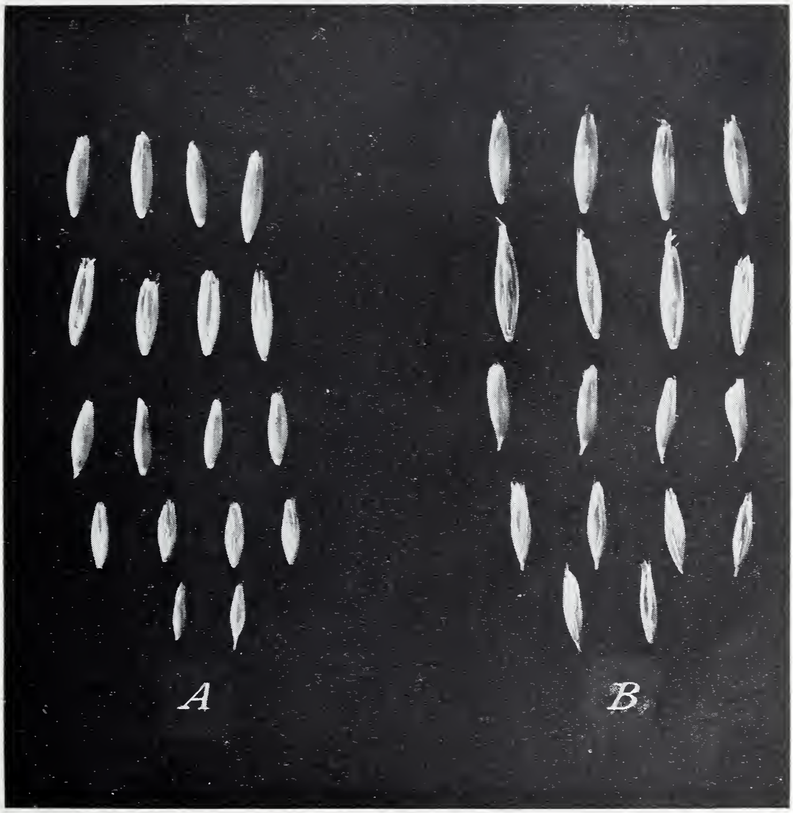

FIGURE 6.—Typical samples of stocks of pure seed of (*A*) Fulghum and (*B*) Red Rustproof oats. Awns, basal hairs, tips of lemmas (grains), etc., removed by threshing. Note awn scars on dorsal side of first and secondary kernels (grains) of Red Rustproof.

Columbia with Winter Turf

During the autumn of 1938 a number of grain samples of Columbia oats labeled "Winter Turf" were submitted to the Department for varietal identification. These varieties are easily confused because of similar grain characters. As previously stated, Columbia is a spring oat that has little or no cold resistance and, where it is sown in the fall, may be lost by winter-killing. It is thus important to be able to distinguish it from Winter Turf when only seed samples are available. Panicles, spikelets, and florets (grains) of these varieties are shown in figure 7.

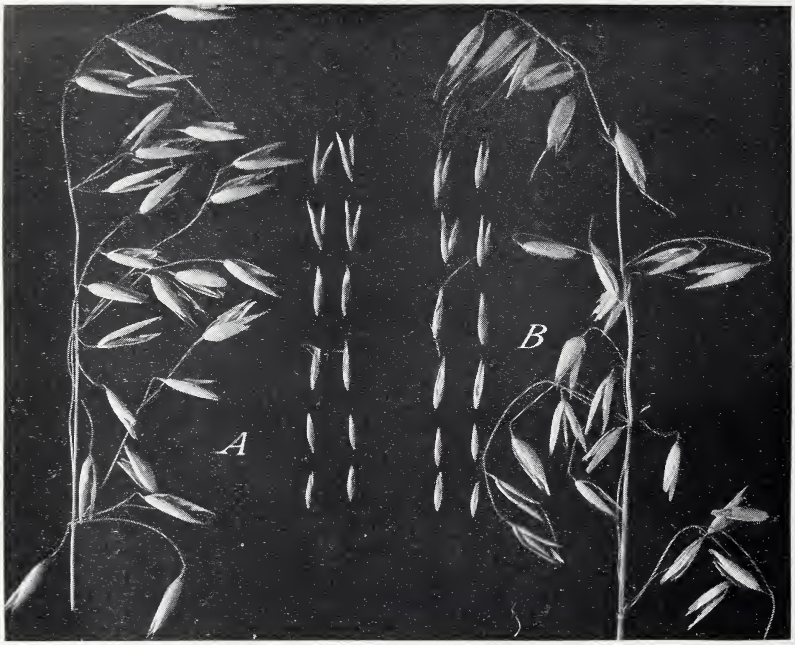

Figure 7.—Panicles, spikelets, and florets (grains) of (*A*) Columbia and (*B*) Winter Turf oats. (Natural specimens, not modified by threshing, etc.)

Winter Turf, also known under the strain names of "Gray Winter," "Oregon Gray," "Virginia Gray," and "Virginia Grazing," is an old variety of winter oats that has been grown in the more northern parts of the winter-oat belt for many decades. The variety may be recognized in the field in the early growth stages by its narrow, bluish-green leaves, turflike winter habit, and, when mature, by its tall straw, very late maturity, and gray to grayish-striped grains. However, about the only character that can be used with any degree of certainty to identify the seed is the grayish-striped appearance of the grain (lemma or kernel with hull). The grain is really gray with conspicuous light-colored veins that give it the grayish-striped appearance. This character long has been used to identify the Winter

Turf variety, hence the descriptive strain names "Virginia Gray," "Gray Winter," and "Oregon Gray" (fig. 8).

Columbia is a comparatively new variety, having been first distributed to farmers of Missouri in 1930. By 1938 it had become the most important variety in that State and also of considerable importance in some adjacent States, especially those to the east. It is a very early, midtall variety, resembling Burt rather than Fulghum in many characters. Columbia is erect in early growth habit, whereas Winter Turf is prostrate in early growth habit. The grain of Columbia is brown, with conspicuous light-colored veins, as in Winter Turf. Columbia has been described as gray, but the portions of the lemma or grain between the light-colored veins is grayish brown to brown; thus the variety is better described as having brown or grayish-brown grains or kernels. As these brownish stripings are rather distinct, they serve to distinguish Columbia from Winter Turf, in which the stripes are more grayish. It is on this character almost alone that the seedsman and the farmer must depend to differentiate between the two varieties when grain samples only are available. Another fairly reliable character is the color of the palea (inner chaff). In Winter Turf the palea usually is grayish like the lemma (outer chaff) or the grain, whereas in Columbia the palea usually is of a

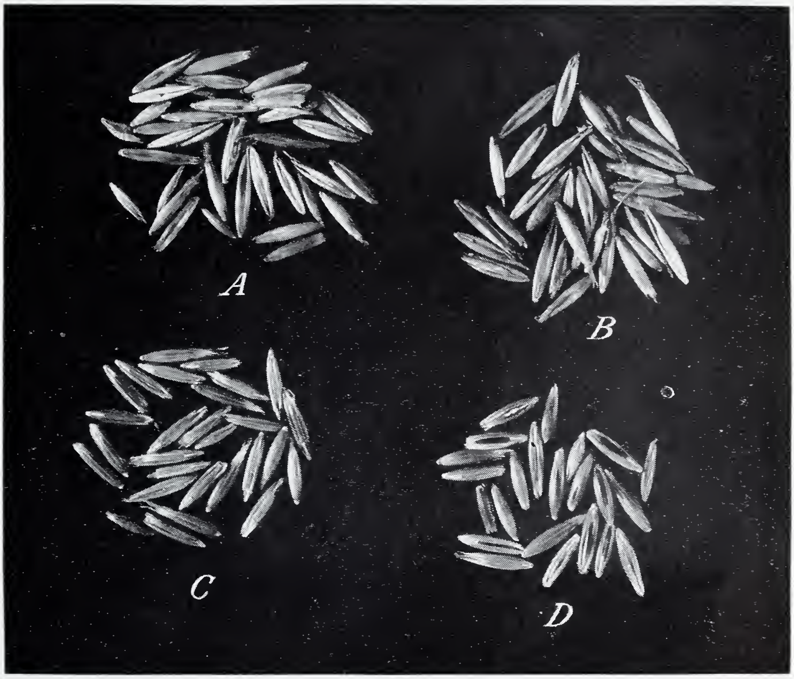

FIGURE 8.—Mixed sample of Winter Turf and Columbia oats: *A*, Mixture as received; *B*, Winter Turf (separation); *C*, Columbia (separation); *D*, high-grade Winter Turf.

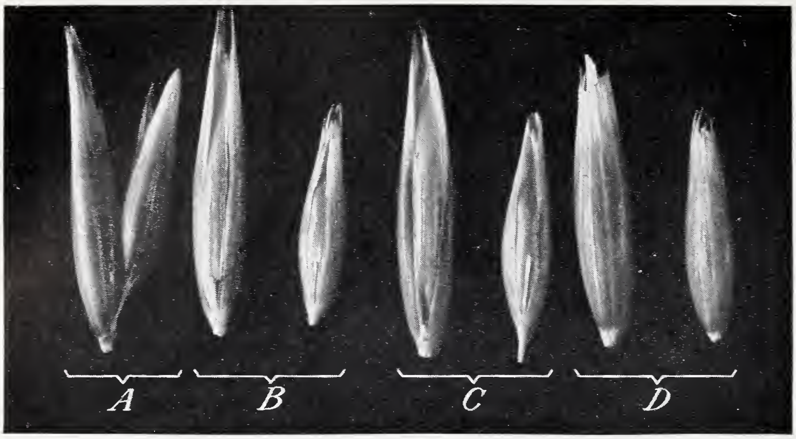

FIGURE 9.—Spikelets and florets (kernels or grains) of Columbia oats: *A*, Spikelet with two florets; *B*, ventral side of first and secondary grains showing *sativa* type of floret separation; *C*, ventral side of first and secondary grains showing *sterilis* type of floret separation; *D*, dorsal side of first and secondary grains.

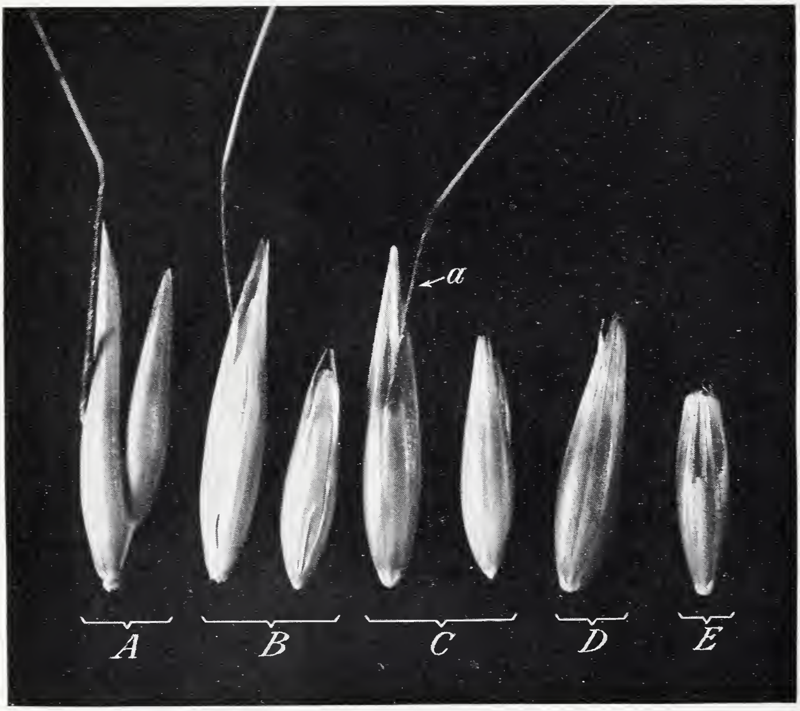

FIGURE 10.—Spikelets and florets (grains or kernels) of Winter Turf oats: *A*, Spikelet with two florets. *B*, Ventral side of first and secondary grains: *C*, Dorsal side of first and secondary grains: *a*, Awn (beard) of twisted and geniculate (bent) type. *D*, First grain without awn. *E*, First grain showing awn scar and removed tip of lemma.

light-brownish color. If not altered by weathering, the real difference in color between the two varieties probably is more definite in the palea than in the lemma, because of the light-colored veins, which modify the appearance of the basic color in the lemmas of both Winter Turf and Columbia.

Most named strains of Winter Turf usually are rather heavily awned, and as a consequence the presence of awns in the variety will be evident in the threshed grain. Occasional awns will adhere to the larger grains, which usually are quite noticeable. Furthermore, on other grains (lemmas) the scars left where the awns were attached may be seen, thus indicating that most of the lower grains of the spikelet carried awns (figs. 7, 10). Columbia, on the other hand, under most conditions has few or no awns, and as a result few or no awn-attachment scars will be noticeable in the threshed grain of the variety. Also, the grains of Columbia are slightly more slender than those of Winter Turf. This difference, however, varies with environment and season and is not altogether reliable for identification (figs. 8, 9, 10).

Although, as already pointed out, the difference in color of the stripings of the grain is the most useful character for distinguishing Columbia from Winter Turf, staining by weathering may so alter this character that the varieties cannot be distinguished. However, in most samples of these varieties that have come to the Department's attention, this difference in grain color was quite evident.

FULGRAIN WITH FULGHUM

Fulgrain is a new smut-resistant variety of red oats developed and distributed by Coker's Pedigreed Seed Co., Hartsville, S. C. It was originated from a cross between Big Boy (Coker Norton No. 20–93) and Navarro, a smut-resistant oat. Fulgrain, Strain 1, was first distributed in the fall of 1936. Another stock of Fulgrain, known as Strain 2, was distributed in 1937. For the purpose of this circular, however, only the Fulgrain variety is considered, as the two strains are identical in plant and grain characters.

Fulgrain is similar to Fulghum in the field, but usually the two can be separated on the basis of grain characters. Panicles, spikelets, and florets (grains) are shown in figure 11. Fulgrain has slightly larger, broader, and plumper grains than Fulghum. The second floret separates consistently from the first by fracture or tearing of the rachilla segment at the base of the first floret as in Red Rustproof. This difference is shown in figures 4 and 12. The absence of numerous basal hairs and awns or awn scars on the second floret differentiates Fulgrain from Red Rustproof. Also, Fulgrain has smaller basal scars or suckermouths than Red Rustproof. In grain characters Fulgrain is, therefore, more distinctly a red oat than is Fulghum. So far, confusion of Fulgrain and Red Rustproof has not come to the attention of the Department, but samples of Fulgrain have been submitted for varietal identification with no other name except "Red oats." Samples of Red Rustproof, Fulghum, Fulgrain, Winter Turf, Lee, and Columbia are shown in figure 13. Typical florets (grain) from threshed samples of Red Rustproof, Fulgrain, and Fulghum are shown (enlarged) in figure 14.

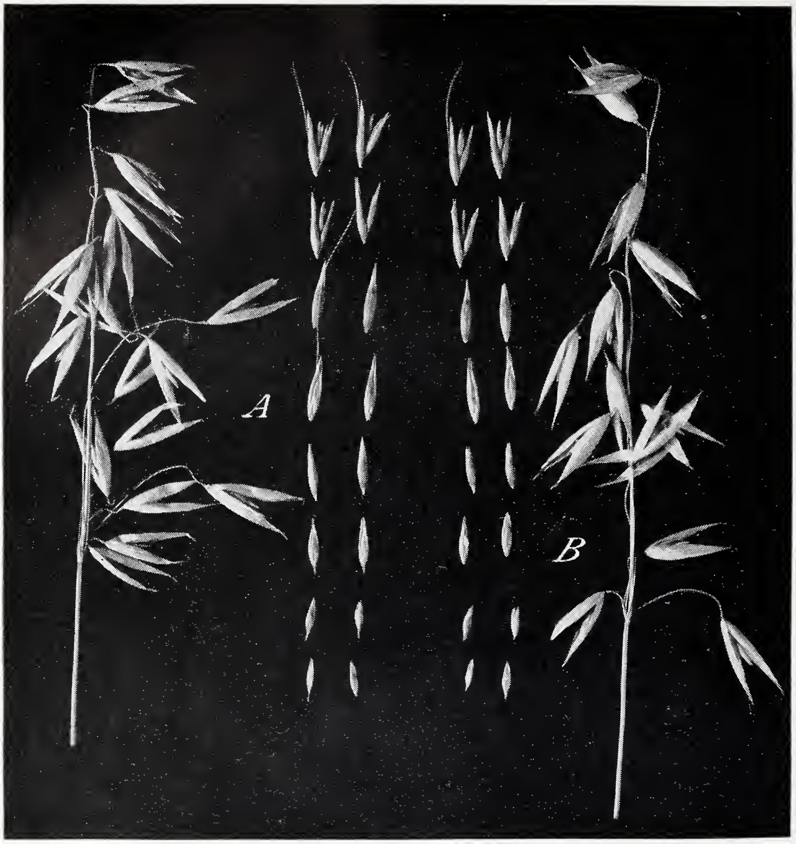

FIGURE 11.—Panicles, spikelets, and florets (grains) of (*A*) Fulgrain and (*B*) Fulghum oats. (Natural specimens, not modified by threshing, etc.)

OTHER VARIETIES

Brief mention should be made of the Lee and Burt varieties. Lee is a new winter common oat originating from a cross between Winter Turf and Aurora that is grown from fall seeding in North Carolina and Virginia. It may be readily identified by its short, yellow, plump kernels (grains), many of which have numerous short, basal hairs. So far Lee (fig. 13, *E*) has not been confused with other winter common varieties.

Burt is a very early variety of spring oats grown to some extent in some sections of the South. Owing to its great variability in plant and grain characters and the consequent difficulty in maintaining satisfactory seed stocks, this variety—greatly to the advantage of the grower—is being replaced to some extent by Fulghum and Columbia. During recent years nearly all the samples labeled "Burt" that have been submitted to the Department have been a mixture of varieties, and as a rule a varietal identification was not possible. So far, absolutely pure-breeding strains of the variety have not been isolated, and because of this genetic instability the variety will probably sooner or later become obsolete.

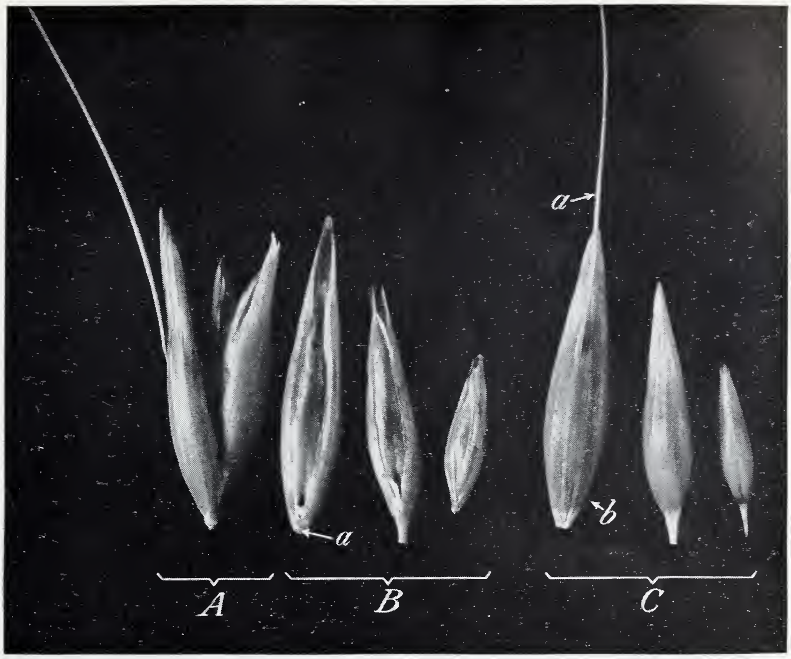

FIGURE 12.—Spikelets and florets (kernels or grains) of Fulgrain oats: *A*, Spikelet with three florets. *B*, Ventral side showing palea of grains from a three-flowered spikelet: *a*, Small or almost obscure basal scar. *C*, Dorsal side of grain from three-flowered spikelet: *a*, Awn (beard) of straight or non-twisted type; *b*, basal hair.

PRODUCTION OF PURE SEED OF ADAPTED VARIETIES

As previously mentioned, sufficient good-quality, home-grown seed of adapted varieties is not produced in the South. The rapid deterioration of Fulghum oats has been a pertinent subject of discussion by those interested in oat improvement in the South for several years. The situation in 1926 was described as follows: [2]

> The maintenance of varietal identity is one of the most pertinent problems which confronts the oat producers of the South. The writer is not unmindful of the difficulty of retaining at a fair standard of purity such varieties as Fulghum and Red Rustproof, and the difficulty in differentiating between them from grain samples. Experience in collecting and receiving seed for identification and experimentation from various sources in the South has emphasized the importance and difficulties of the problem. Commercial samples of Red Rustproof frequently contain a mixture of Fulghum, while on the other hand Fulghum often contains some Red Rustproof. Other varieties also frequently are present.
>
> It has been shown by pure-line selection that the Red Rustproof variety is homozygous and can be maintained in a uniform and pure condition by careful handling of the seed. Just why so much nondescript, so-called Red Rustproof oats are still grown in the South the writer has been unable to determine. There are available such well-known standard strains of Red Rustproof as Coker Appler, Hastings (Hundred Bushel), Patterson, Ferguson No. 71, and improved strains from experiment stations. These should replace the unselected and conglomerate strains of Red Rustproof which still are grown in many districts.
>
> Fulghum, on the other hand, does not possess the stability of type which characterizes the Red Rustproof oat. This variety frequently produces aberrant

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[2] STANTON, T. R. BREEDING WINTER OATS FOR THE SOUTH. Amer. Soc. Agron. Jour. 18: 804–814. 1926. See pp. 811–813.

forms including the so-called "false wild." The most common aberrants are plants with off-colored kernels. The most numerous are black in color, although some plants produce gray, brown, or almost white kernels. Usually these aberrant plants are taller than those of typical Fulghum and can be removed by roguing.

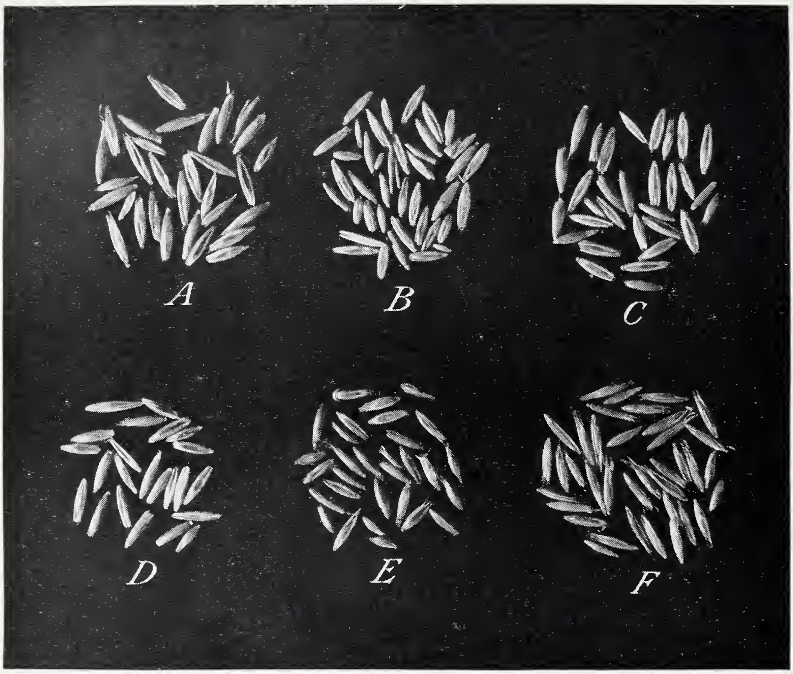

FIGURE 13.—Threshed samples of oats of six varieties: *A*, Red Rustproof; *B*, Fulghum; *C*, Fulgrain; *D*, Winter Turf; *E*, Lee; *F*, Columbia.

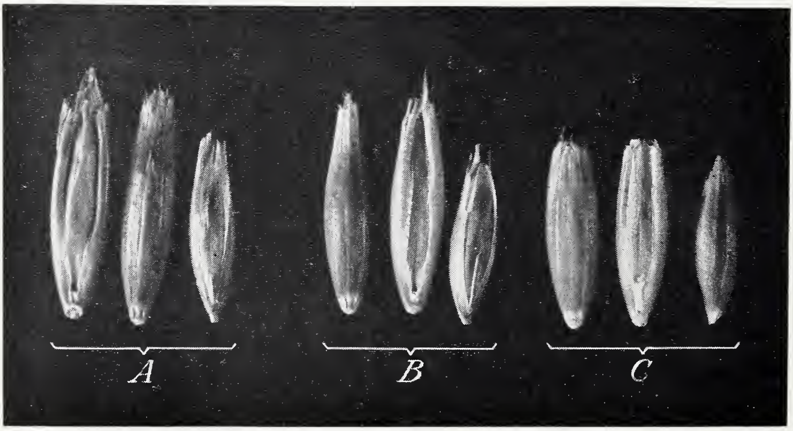

FIGURE 14.—Typical grains (kernels or florets) from threshed samples of three red oat varieties (note broken-off tips of lemmas). *A*, Red Rustproof (note *sterilis* type of second floret separation, large basal scar or suckermouth, and awn scar on middle grain). *B*, Fulgrain (note *sterilis* type of second floret separation and obscure basal scar of first floret). *C*, Fulghum (note *sativa* type of second floret separation and small to obscure basal scar).

The foregoing statement applies almost as well today as it did in 1926. Although additional improved strains of Fulghum and Red Rustproof oats have been developed and distributed, the problem of obtaining ample supplies of seed free from contamination and true to these varieties still remains. An abundant supply of high-quality seed of the various named strains of the Red Rustproof variety should be available in nearly all years, as there are no inherent difficulties in the maintenance of type or purity of seed.

However, with regard to Fulghum, the situation is even more serious than in 1926. Since that time many selections of Fulghum have been made and a few have been distributed as improved varieties or strains for farm production, but in general the attempts to improve Fulghum by selection have not been very successful. So far oat breeders have not been able to isolate absolutely pure-breeding strains of the variety. Many of the selections have shown more uniformity than the original variety and, for practical purposes, are satisfactory for a few years. It is believed that where some attention and effort are given to keeping Fulghum as pure as possible—such as the prevention of contamination with volunteer oats by proper seedbed preparation and roguing out the black-seeded and other offtype plants from fields being harvested for seed purposes—fairly pure stocks of the variety may be maintained. In some sections the offering of a premium for carefully grown seed or for seed from certified fields might stimulate the production of seed of Fulghum oats of better quality.

CONFUSION CAUSED BY TOO MANY NAMED STRAINS OF THE SAME VARIETY WITHOUT DEFINITE IDENTIFICATION

It is generally admitted that there are too many so-called varieties or named strains of oats grown on farms. This also is true with regard to wheat, cotton, and other crops. In the South the number of actual oat varieties available is comparatively small, but in recent years the number of new strains of these varieties has multiplied and has caused confusion, particularly among those who are not familiar with oat varieties. The breeding and distribution of numerous new strains by selection and hybridization may serve to complicate further rather than to simplify the problem. Furthermore, in the future it may be necessary to fix, if possible, in every new variety some easily observed and constant characters that may serve as a definite mark of identification. For example, several named strains of Fulghum are now being grown, in addition to the original Fulghum first distributed in Georgia. These are Coker Fulghum 4, Franklin, Frazier, Kanota, Marett Fulghum, etc. Of these Fulghum strains, Franklin may be considered a distinct variety because of its taller straw and shorter kernel. Frazier under some conditions produces more awns and is considered as not being altogether typical of Fulghum. Coker Fulghum 4, Kanota, and Marett Fulghum are similar to the original variety in nearly all characters.

Many strains of the Red Rustproof variety have been developed, named, and distributed for growing on the farm. These named strains may differ a few days in time of ripening, some may be a little taller, others a little hardier, or a little more productive; yet so far as grain characters are concerned, no difference can be observed. Samples of different strains of Red Rustproof oats that appear on the market for seed purposes are shown in figure 15. The most important economic strains today, in the order named, are Ferguson No. 922, Nortex, Hastings (Hundred Bushel), and Appler. The development and distribution during the next 10 years of still other new strains of Red Rustproof resistant to smut and rust may further increase the list of Red Rustproof strains.

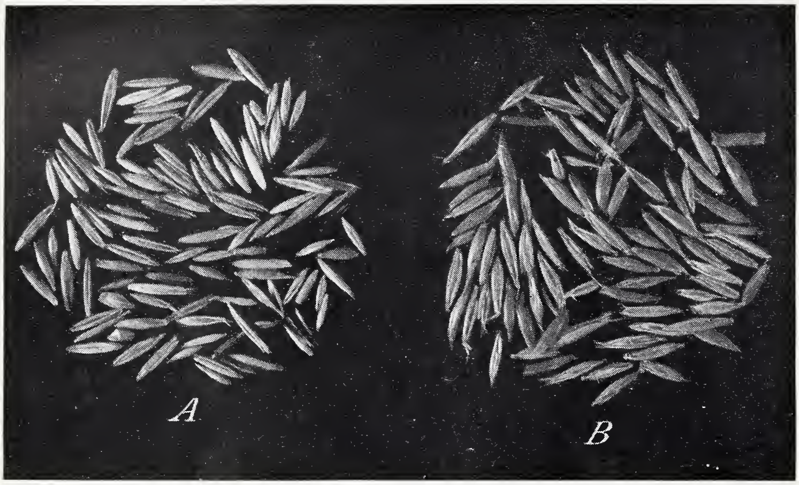

FIGURE 15.—Samples of seed of commercial Red Rustproof oats: *A*, Badly mixed; *B*, pure stock true to variety. (Note remaining parts of awns on many kernels (grains), awn scars on others, and the crushed tips of the lemmas (grains)).

If these improved varieties or strains are to become contaminated with other varieties within 2 or 3 years after distribution, the expenditure of time and funds in their development may not be justified.

STATE SEED LABORATORIES CHECK ON VARIETIES AND QUALITY OF SEED

Several of the State seed laboratories of the South are making much progress in checking on variety and quality of seed oats shipped into and sold in their respective States. Excerpts from letters received from seed laboratories in Alabama and Virginia are given below.

In response to a letter received by the United States Department of Agriculture from a commercial grain company, complaining that the seed laboratory of the Department of Agriculture and Industries, Montgomery, Ala., would not accept their lots of Fulghum and Red Rustproof oats offered for seed, L. N. Allen, seed analyst, of that laboratory, to whom a copy of the letter was forwarded, wrote as follows:[3]

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[3] Letter dated January 20, 1939, to T. R. Stanton.

> This is just another bit of evidence that our efforts here in Alabama are making an impression. Many have refused to ship certain varieties, particularly Fulghum, into this State this year because they were so badly mixed. I believe, also, that there has been a cessation of shipping of red oats from Indiana and Illinois into Alabama this year to be sold as Red Rustproof (Red Texas) seed. On the whole, I feel very much encouraged and believe the situation will be so much better in another year or two that very little laboratory time will have to be devoted to determining whether the oats are mixtures of varieties or as labeled.
>
> I believe that, in 10 years, we have made very marked progress in controlling the sale of unadapted varieties of soybeans and have had a marked influence on the sale of rye as Abruzzes Rye and mixed oats as a pure type of oats. Over a long period of time, our efforts, coupled with that so necessary support from the members of the United States Department of Agriculture, have and will continue to produce beneficial results through the reducing and preventing of misbranding.

Concerning the misbranding of oat varieties and the sale of Columbia as Winter Turf oats, offered for fall seeding in Virginia, G. T. French, chief botanist and State entomologist, Division of Plant Industry, Department of Agriculture and Immigration, Richmond, Va., wrote as follows: [4]

> During this present fall season we have had quite a good many samples which have come in labeled "Winter Gray" and which we have every reason to believe are largely Columbia. We have given publicity to the situation in our Department bulletins, and there was one press release carried by the Richmond papers and probably copied by some of the smaller county papers. I presume that nearly all of the large seed distributors, including some grain brokers in Virginia, are now fairly well informed as to this Columbia oat; but comparatively few of the smaller seed merchants and very few farmers, I venture to say, know anything about it.

These statements are sufficient to indicate that where State seed laboratories are actively interested in better seed oats for their respective States, much can be done to assurè the farmer seed true to variety and reasonably free from contamination with other oat varieties, other grains, noxious weed seeds, etc. Greater vigilance on the part of other State seed laboratories in this respect would aid materially in improving the seed-oat situation in the South.

CROP-IMPROVEMENT ASSOCIATIONS BENEFICIAL

Crop-improvement associations can do much in making high-grade seed available to communities by inspection and certification of fields of recommended varieties grown for seed purposes. For example, the North Carolina Crop Improvement Association, Inc., is making marked progress in developing a system of seed inspection and certification that is assuring better seed of adapted varieties. A. D. Stuart, seed improvement specialist for this association, has contributed the following statement: [5]

> Certified seed oats provide the farmers of North Carolina with a type of crop insurance that pays extra in a great many ways. Planting seed of high quality both in germination and mechanical purity as well as in varietal purity is of great value in lowering the quantity of worthless oats shipped into the State each year. Some 28,000 bushels of certified seed oats were produced by growers last year, and although this is far below the quantity required to plant the 281,000 acres grown in the State, it provides a nucleus on which to work. With the development of high-yielding, better-quality, cold- and smut-resistant varieties in the past few years, North Carolina is going forward in oat production, striving to better the 20-bushel-per-acre yield now prevalent on so many farms. Certified seed growers average between 50 and 60 bushels of oats per acre, which challenges the interest and attention of those growers who still cling to the old nonproductive varieties.

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[4] Letter dated November 10, 1938, to T. R. Stanton.

[5] Letter dated January 4, 1939, to T. R. Stanton.

The Division of Field Seed Certification of the State Department of Agriculture, Austin, Tex., registers and certifies field seeds, including oats, and is doing much to assure better field seeds for Texas farmers. This organization also maintains a list of registered plant breeders and uses as its slogan, "Know the quality of the seed you sow." Effective work also is being done by similar organizations in other Southern States, particularly Virginia, Tennessee, Arkansas, and Oklahoma.

NEW AND BETTER VARIETIES ARE IN PROGRESS OF DEVELOPMENT

Since the introduction, by the United States Department of Agriculture, of Victoria oats from South America in 1927 and Bond oats from Australia in 1929, varieties resistant to crown rust and smut, programs for the development of disease-resistant and more productive varieties have been inaugurated by State agricultural experiment stations and commercial seed companies of the South. For the most part these breeding programs are conducted in cooperation with the Department. As a consequence, numerous new strains of Fulghum and Red Rustproof, resistant to crown rust and smut, are already available and well advanced in tests for yield, quality, etc. Some also are being increased for distribution. If the identity of these new varieties and strains is to be maintained and the greatest economic value realized from them, every means available and every effort possible must be put forth to assure the farmer that he will be able to purchase pure seed in quantity.

SUMMARY

The maintenance of varietal identity and purity in southern red oats has been a perplexing problem for many years. The distribution of numerous improved strains of the relatively few known varieties has further complicated the problem. The mild winters greatly favor volunteering of oats and other grains and encourage the growth of noxious weeds, thus bringing about the rapid contamination and deterioration of varieties.

A greater appreciation of the need for seed of adapted varieties of known breeding should be encouraged. It is still too true that in many sections "oats are just oats," regardless of the recommendations of agricultural improvement agencies.

The characters of most southern oat varieties and strains have been described in the literature, but much confusion still exists in the identification of certain varieties. Fulghum and Red Rustproof, old and widely distributed varieties, are still being mislabeled. The development of new varieties similar to certain old ones is also leading to confusion. For example, Columbia, a new spring variety, is being sold as Winter Turf. Another example is that of Fulgrain, a new smut-resistant variety, which, because of similarity of certain grain characters, is being confused with Fulghum.

Results of controlled breeding experiments have shown that no difficulty is experienced in the maintenance of pure seed stocks of any of the numerous named strains of Red Rustproof. This variety is stable or pure-breeding. Unfortunately, Fulghum lacks this stability and so far breeders have failed to isolate pure-breeding strains. Nevertheless, with the prevention of contamination by volunteering and with some attention given to roguing the black-seeded and other offtypes, fairly pure seed of Fulghum may be maintained.

The development of many named strains of the same variety lacking definite marks of identification also causes much confusion. Difficulty arises where attempts are made to identify the different named and commercial strains of Red Rustproof and Fulghum oats.

Much is being accomplished by some State seed laboratories and crop improvement associations in making available to the farmer better seed, true to variety, of known breeding. Much more can be done by the manifestation of greater interest on the part of similar organizations in other southern States.

It is likely that within the next 10 years new and more productive disease-resistant varieties and strains of southern red oats will be distributed; therefore, safeguards should be set up to protect their identity and purity, otherwise their greatest economic value may not be realized.

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